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GENERAL NOTES.

Mutual Occultations and Eclipses of the Satellites of Jupiter in 1908.—At the meeting of the Royal Academy of Sciences of Amsterdam on October 27, 1906, Professor J. A. C. OUDEMANS presented a paper on "The Mutual Occultations and Eclipses of the Satellites of *Jupiter* in 1908." A short account of the paper may be of general interest, as the phenomena can be observed by any one possessing a telescope.

The orbits of the four larger satellites of *Jupiter* lie in approximately the same plane. When the Earth is in or near this plane the satellites would appear to move forward and backward along a straight line, thus occulting one another in passing. In the same way, when the plane of the orbits passes through the Sun, there would be mutual eclipses of the satellites. The orbital plane passes through the Earth and the Sun twice in each revolution of the planet, so that these phenomena occur at intervals of about six years. The plane passes through the Sun on April 25, 1908, and through the Earth on July 8th of the same year, so that near these times the respective observations may be made. Some difficulty may be experienced in making the observations near the latter date as *Jupiter* will be at a low altitude, passing to conjunction with the Sun on August 17th.

Up to the present time but few such occultations have been observed, and there is only a single recorded instance of mutual eclipse. For this reason the observations of next year will have a special interest, and their value will lie in furnishing data to correct the elements of the satellite orbits. If these orbits all lay in exactly the same plane, mutual eclipse would occur at each heliocentric conjunction of two satellites near the time named, and similarly mutual occultation at each geocentric conjunction. As this, however, is not the case, some of the conjunctions will occur without bringing about either eclipse or occultation. In the latter case those using micrometers can make observations of value by measuring the difference in declination at the time of conjunction.

The following list is taken from a table given by Professor OUDEMANS, and contains the occultations and eclipses visible at the Lick Observatory. This will serve for the Pacific Coast States. In observing it will be well to begin before the computed time and watch the progress of the phenomenon as the times given are for central eclipse or occultation.

Time of Eclipse. 1908.	Pacific S. T.	Eclipsed Satellite.	Eclipsing Satellite.	Direction from *Jupiter.*
April 2	$10^h\ 3^m$	I	III	East
3	8 26	IV	I	West
4	8 52	IV	II	East
4	9 21	I	II	East
5	11 56	III	II	West
6	12 12	III	I	East
9	12 52	I	III	East
11	7 42	II	IV	East
11	11 43	I	II	East
11	12 24	I	IV	East
22	7 13	IV	II	East
May 1	9 5	II	III	West
1	10 43	II	I	East
5	9 57	III	II	East
6	8 38	I	II	East
10	8 41	I	II	West
11	7 26	III	II	West
13	11 31	I	II	East
17	8 9	I	II	East

Time of Conjunction. 1908.	Pacific S. T.	Occulted Satellite.	Occulting Satellite.	Direction from *Jupiter.*
May 31	$8^h\ 46^m$	I	II	East
June 8	7 57	IV	II	West
9	9 18	III	I	West
29	7 56	I	II	West
July 11	6 57	II	I	West

March 7, 1907.

E. A. FATH.

Recent Double-Star Observations.—In Part 3 of Volume X of the *Publications* of the Washburn Observatory, Professor GEORGE C. COMSTOCK publishes the results of his observations of double stars in the years 1897-1906, made with the 15-inch refractor. The measures are arranged in the same form as those previously published by the same observer in Part 1 of Volume X, and constitute with them a homogeneous series.

It is a pleasure to examine this publication, for the observing list has been carefully selected, including only stars in need of measures; the stars have been observed systematically, and the results are arranged in convenient form for the use of investigators, with no superfluous matter. It is to be hoped that his many other investigations will not prevent Professor COMSTOCK from continuing with his double-star observations.

A volume of quite different character is one entitled "Measures d'Etoiles Doubles faites a l'Observatoire de Chevreuse de 1904 a 1906, par MAURICE FARMAN." The exterior of the volume leads one to infer that M. FARMAN was a most industrious observer, for it is a quarto publication of 128 pages. Examination shows, however, that M. FARMAN'S own observations occupy only one line for each star, the remaining lines—half a column in many cases—being devoted to a résumé of other observers' results between the years 1875 and 1895. As the observing list is drawn almost exclusively from the lists of STRUVE, OTTO STRUVE, and BURNHAM, of which we possess catalogues giving practically complete histories of each star to the present time, it would seem that the space thus occupied in the present volume could have been used to better advantage by giving the observer's own results in more detail. As it is, he gives only the distance, angle, and date, without any information as to the number of nights the pair was observed, the atmospheric conditions, the hour-angle, or the accordance of the measures. It is stated in the introduction that each position-angle is the mean of five settings, and each distance the mean of ten double-distance measures, and it is perhaps to be inferred that each star was observed on one night only. The measures were made with a refractor of $0^{m}.24$ aperture, and an eye-piece magnifying about 500 diameters. R. G. A.

Eros Comparison-Stars and the Magnitude Equation.—In Number 111 of these *Publications* a brief note was printed calling attention to Dr. FRITZ COHN'S investigation of the reference-stars used for the observations of *Eros*. Dr. COHN concluded that the photographic determinations of the positions of these stars at several observatories show a decided magnitude equation. In a later number of the *Astronomische Nachrichten*, Professor HINKS, of Cambridge, England, who has made a very thorough study of the *Eros* comparison-stars, controverts this conclusion and gives his reasons for thinking that whatever other systematic errors may inhere in the photographic method, these particular observations are free from this special error. A very interesting discussion of the whole question has thus arisen, and a number of articles on the subject may be found in the *Astronomische Nachrichten,* the *Monthly Notices R. A. S.,* and other journals, the outcome of which cannot yet be stated.

It has long been known that practically every meridian observer has a personal equation due to magnitude,—that is, that he observes the transit of bright stars relatively too early as compared with the transit of fainter stars. Careful observers usually determine the amount of this equation by a series of special observations in which the transit of bright stars over half the field is observed at full brightness, and over the other half through a screen placed before the object-glass which reduces the brightness several magnitudes. It has been claimed, and Dr. COHN assumes in his argument, that observations with the Repsold self-registering transit-micrometer are free from this systematic error. The questions at issue can only be decided by careful investigations by expert observers. To the amateur perhaps the most interesting feature of the whole discussion is the minuteness of the quantities involved. It is another illustration of the high standard of precision that modern astronomy sets for its followers.

Probabilities.—If any of the readers of these notes are engaged in teaching the theory of probabilities to classes in algebra or the method of least-squares, they may be interested in the example given on page 155 of this number. The textbooks contain plenty of examples, but they are usually "made-up" ones. The writer has often thought that a few real examples, showing that actual results do come out in practical agreement with those computed by theory, would be very helpful in presenting this subject.

The computations employed in the example just referred to may be used in considering other programmes of work which are dependent upon the weather. For instance, suppose a proposition is made to establish a number of astronomical stations, widely separated along the path of totality, for the purpose of observing changes in the outer envelopes of the Sun during the progress of a total eclipse of that body. The question naturally arises, What is the probability of the skies being clear at *all* of the stations on eclipse day? In order to give concreteness to the problem, let us suppose that it is equally likely to be clear or cloudy at any station, which is not far from the true state of affairs for most localities, then the probability of obtaining clear sky at any particular station is one half. The probability of obtaining clear skies at any two stations (separated sufficiently so as not to be under the same local weather conditions) is the product of their separate probabilities, or one fourth; of three stations, one eighth; of four stations, one sixteenth; of five stations, one thirty-second. If, then, some problem should be proposed which depends for its solution upon observations to be made at five widely separated stations upon the same day, it is seen that it would be utterly foolish to expend money for this purpose, because there would be only one chance in thirty-two of obtaining the required observations. S. D. T.

Notes from "Science."—Professor JOHN KROM REES, since 1881 professor of geodesy and astronomy and director of the Observatory of Columbia University, died on March 9th, in his fifty-sixth year. Professor REES had been ill for several years and had recently been made Professor Emeritus.

Professor HENRY DAVIS TODD, U. S. N. (retired), died at Annapolis, on March 8th, at the age of sixty-nine years. Professor TODD served through the Civil War with distinction, and became head of the Department of Physics and Chemistry at Annapolis in 1878. From 1886 to 1899 he was assistant on the Nautical Almanac, and was director from 1899 to 1900, when he retired.

The death is announced of Mr. HENRY CHAMBERLAIN RUSSELL, F. R. S., government astronomer of New South Wales since 1870, at the age of seventy-one years.

The New York Assembly on March 5th passed the Young Bill, which provides for the establishment of a nautical museum and observatory in Bronx Park, New York.

Dr. GEORGE E. HALE, director of the Solar Observatory of Mt. Wilson, has been elected one of the alumni members of the corporation of the Massachusetts Institute of Technology.

Mr. C. G. ABBOT, who had been for a number of years Secretary LANGLEY'S principal assistant in the Astrophysical Observatory of the Smithsonian Institution at Washington, and latterly its acting director, has been appointed director of the observatory, and Mr. F. E. FOWLE, Jr., hitherto junior assistant, has been appointed aid.

M. HENRI POINCARÉ has been appointed a member of the council of the Observatory of Physical Astronomy at Meudon, in the room of the late M. MOISSAN.

Funds have been donated by Mr. WILLIAM C. SPROUL, State Senator, of Chester, Pa., for the purchase of one of the largest telescopes on the Atlantic Coast for Swarthmore College. The exact amount of the gift, or the size of the telescope, is not known, but the instrument will be quite as efficient as the Government's telescope at Washington or the University of Virginia's telescope at Charlottesville, which are the two largest instruments in the East. The telescope will be in charge of Dr. JOHN A. MILLER, professor of mathematics and astronomy. Senator SPROUL is a member of the board of managers and has been active in the management of the institution since his graduation, in 1891.

Dr. H. C. VOGEL, of the Astrophysical Observatory at Potsdam, has been awarded the Maximilian order for art and science of the Bavarian government.

Professor DAVID P. TODD, of Amherst College, sailed on the "Panama" on May 11th for Colon, Panama, Callao, Peru, and Iquique, Chile, in charge of the Lowell Astronomical Expedition to the Andes, sent out by Professor PERCIVAL LOWELL, of Boston. Mr. E. C. SLIPHER is photographer, Mr. A. G. ILSE, of Alvan Clark & Sons, the instrument maker, and Mr. R. D. EAGLESFIELD, mechanician. The party will observe the opposition of *Mars* with the 18-inch telescope of Amherst College Observatory, and the annular eclipse of the Sun, July 10th, for Professor NEWCOMB.

Abstracts of Papers.—Two recent numbers of *Science,* April 12th and 17th, contain accounts of the meeting of the Astronomical and Astrophysical Society of America, held in New York during the last convocation week in connection with the annual meeting of the American Association for the Advancement of Science. Thirty-one papers were presented before the society and four papers upon astronomical subjects before

Section A of the Association. If we may judge from the titles, many of these papers must have been very interesting. Abstracts of most of them may be found in the numbers of *Science* just referred to.

The American Astronomer.—In a recent issue attention was called to the *Journal* of the Royal Astronomical Society of Canada, a new periodical, published bi-monthly, and similar in scope to our own *Publications,* the *Journal R. A. A.,* and others designed to extend and popularize the study of astronomy. The second number meets the expectations raised by the initial issue, and we trust the *Journal* has entered upon a long life of usefulness.

A publication of a different type is "*The American Astronomer,* an international publication for practical astronomers," published at Marlborough, Mass., of which two numbers have appeared. The object of this journal is to give prompt intelligence of items of interest to astronomers, and it is therefore the aim of the editor, WM. D. MCPHERSON, to publish as often as possible. At present the paper will appear monthly. It is an experiment worth making, and the result will be watched with interest. The subscription price is placed at $2.00 per year.

"*How to Know the Starry Heavens.*"—We are glad to note that this work on popular astronomy by one of the members of our Society, Mr. EDWARD IRVING, has been well received by the public. Very favorable comments have been printed in many journals, like the *Outlook,* that notice scientific books likely to interest the general public. Mr. IRVING'S facts are correct, his style free from technicalities, and his illustrations numerous, well chosen, and well-executed reproductions from excellent modern photographs and drawings.